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Our Planet . . . Our Solar System

Curriculum Unit 96.06.08
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INTRODUCTION

My curriculum unit, divided into five sections, is targeted at first grade explorers. It has been created to spark interest and enthusiasm among young learners in the study of the planets, our Sun and other stars, natural satellites and other components of our Solar System. Keeping in mind that (1) abstract concepts are often difficult for many children at this age [generally five through seven] and (2) the varying abilities of these children, several tactile, kinesthetic, visual and auditory activities have been included to bring the learning experience and subject matter to life. Objectives and Skills Focus are also highlighted, and lesson plans/related activities are presented in Discovery Through Related Activities question and answer format. This Science unit, to be presented over a five-week period, will integrate Math, Reading, Language Ads, Social Studies and Art (see Pacing Calendar, Appendix A).

It is my hope that OUR PLANET . . . OUR SOLAR SYSTEM will (1) encourage teachers to make astronomical studies an integral part of their lesson plan, (2) empower children to understand the awesomely wonderful interconnectedness between our planet and other celestial bodies, and (3) help our students recognize that planet Earth is a member of a much larger, universal family.

SETTING THE TONE

Before delving into this five-week study, I recommend taking a quick look at our Solar System through language ads activities. A mystery guessing game is a great way to start.

Call the children to group and encourage them to listen closely:

LOOK AFAR
by Waltrina Kirkland-Mullins
Up in the sky, way beyond the blue
Something wonderful, vast, exciting and new

Is calling . . . calling . . . inviting you
To take a look afar
And explore a place filled with twinkle and light
And objects that orbit, revolve or take flight
Come on, let’s find out what they are!

Emphasize *blue twinkle, light, orbit, revolve* and *take flight* . Encourage full class participation and randomly call on students to share what the subject of this mystery poem (and upcoming Science unit) might be. Conclude by sharing the content of the new unit, and applaud those who have participated and/or have guessed correctly.

Continue by pooling a knowledge base from the children. Make a K-W-L* chart of information provide by your students. Auditory comprehension, logical thinking number concept recognition, visual discrimination can all be incorporated into this introductory segment.

Key Words/Vocabulary

New words will be introduced throughout each unit. Based on student input and information you provide, an ongoing list of key words can be devised. Many of them can be accompanied by picture cues, and can strategically be charted and hung on classroom walls. Among them:

Astronomy	astronomer	cosmology	cosmologist
astronaut	telescope	binoculars	planet
Solar System	galaxy	Universe	planetarium

(Note: Students at this grade level often enjoy becoming familiar with and using “grownup” words, so don’t hesitate to expose them to more advanced terminology. Additionally note that canvassing students for vocabulary words can be surprising! Many of our little ones have a wealth of information under their belt: call on them to see what they know before providing information.)

*K = what you know, W = what you’d like to know, L = what you have learned. After completing each unit segment, or as a culmination to the entire curriculum unit, go back to “L“ and record the children’s responses. The use of the K-W-L serves as a helpful approach in monitoring student absorption and understanding of the subject matter.

Additionally, make the introduction of new words fun and zany by providing the definition and letting the students guess the word. As an alternative, bring in “Secret Show-and-Tell” items, like binoculars hidden in a mysteriously decorated bag. Give misleading hints (e.g., the item in this bag is not alive, but it has “two eyes” that can help you see things that are far, far away.) Subsequently have the children take turns feeling what’s inside the bag. Jot down their observations, and after the children have made a few guesses, reveal the mystery item.

Such exercises can be followed by a shared reading. PLANETS by Kim Jackson (Troll Associates, 1985) is a simplistic opener for young explorers. Post shared reading, PLANETS can be placed in your classroom library or Science center for independent study and/or reading. Wallah! You’ve set the tone for a fun-filled Astronomy adventure!

SECTION ONE: PLANETS 9

Objective : To discover and take a close-up look at the characteristics and personality of each of the nine planets.

Skills Focus :. Size discrimination, number sequence review (with emphasis on ordinal numbers 1 through 10), classifying and categorization, spatial concept recognition (near-far, large-small . . .) and directionality (left-right, front-back . . .), measurement through estimated, non-standard units of measure; developing and enhancing language arts through journal writing, poetry and role play; becoming familiar with non-fiction literature; group/social interactive skill development.

Key Words:	planet	rotate	revolve	axis
	mantle	core	elliptical	gas/gaseous*
	satellite/moon orbit	atmosphere	gravity	

* Note: Help your students conceptualize gases by relating to one with which they may be familiar. (Ask you children, for example, if they have ever seen a balloon inflated by a tank-like machine. The invisible substance that fills up the balloon, causing the balloon to float, is called helium. It is a very light gas—lighter than the air around us. Helium is one of the gases that surrounds many of the planets we will learn about.)

How many planets are there and what are planets?

In sequential order from our Sun, Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune and Pluto constitute the nine planets. Planets can be grouped into two categories: Terrestrial-type or gas-giant planets. Earth, Mercury, Venus and Mars are terrestrial-types. These planets are for the most part rocky, hard, and small with little or no atmosphere (air and gases that surround the planet). They have land masses with hills, mountains, and valleys. One planet alone, Earth, has water—an essential life-giving substance.

Gas-giant planets are surrounded by thousands of miles of thick atmosphere. While they are enormous, they have low density. They rotate on their axes more quickly than terrestrial planets. Jupiter, Saturn, Uranus and Neptune are gas-giant planets. Pluto is an extremely low-mass planet, similar to a terrestrial planet.

Unlike our Sun, planets do not produce all or their own heat and light, but rather depend on the Sun to provide them. They differ in temperature based on their distance from the Sun. An invisible force called gravity keeps them in an elliptical orbit around the Sun, that is, they move around the Sun in an egg-like shaped path.

Planets move around the Sun in a fascinating way: Most spin or rotate on a tilted, invisible rod called an axis. While planets spin, they also orbit (revolve) around the Sun. A planet moves around the Sun faster when it is closer to the Sun, and slower when it is far away. It also rotates faster when it is less dense.

What are satellites?

Several planets have satellites, often referred to as Moons. The word “satellite” is tricky because it can have several meanings. Satellites created by scientist are machines that can be sent through space to learn more about our Solar System. When we, however, discuss satellites that belong to planets, we are describing their Moon(s).

Moons can have a powdery-rocky or icy surface, or a combination of both. They revolve around the planets, just like planets revolve around the Sun. Gravitational pull from a planet helps hold satellites in orbit.

What are the nine planets actually like?

(The use of NASA photos when presenting this information is preferred. See RESOURCE LISTING re: how to obtain complimentary space photos. In addition, the planet information that follows can be xeroxed, cut out and affixed to the back of obtained planet photos for quick-reference purposes.)

MERCURY, the nearest planet to the Sun, has a bumpy, cratered surface, similar to that of the Earth’s Moon. There appear to be a lot of cracks and cliffs on its surface. It has a core comprised mostly of iron and a mantle made of rocks much like Earth. Mercury revolves around the Sun the fastest of all the planets, but it rotates very slowly. Because of this the side of Mercury that faces the Sun is extremely hot. The side turned away from the Sun is extremely cold. Mercury has no satellite and no atmosphere to carry heat around the planet. No life has been found on Mercury. It takes 88 Earth days for Mercury to revolve around the Sun.

VENUS, the second planet from the Sun, rotates the slowest of all the planets. It is a little bit smaller than Earth, and it has no satellites, This planet is surrounded by poisonous, gaseous clouds and winds that blow from east to west. Its surface is filled with craters, enormous mountains, and some volcanoes that may still be active. Venus is extremely hot (the gases that surround Venus contribute to its extremely high temperature). The temperature on this planet is so intense, it can easily melt lead! Thus, no water nor living things have been found or can exist on Venus. It takes 225 Earth days for Venus to revolve around the Sun.

EARTH, the planet on which we live, is the third planet from the Sun. Our planet is the only one that has oceans, breathable atmosphere and all forms of life. Its surface is tilled with mountains, valleys, deserts, and plant-laidened stretches of land. If we were to travel way above the clouds and look down on our planet, we would see that the Earth is mostly covered with water. The rotation of the Earth on its axis gives us day and night. It takes 365 days for our planet to travel around the Sun: The revolution of the earth around the sun gives us our year and seasonal changes. Our planet has one satellite, a Moon called “The Moon”, covered by rocks, powdery seas, craters and mountains. It orbits the Earth in approximately 29 1/2 days. Our monthly calendar is based on that revolution.

MARS, known as the red planet because of its reddish color, is most similar to Earth of all the planets. The fourth planet from the Sun, Mars has deserts, enormous mountains, deep canyons and craters large and small. It has the largest volcano among all the planets. That’s where its similarity with Earth ends: Unlike our planet, there is no permanent water surface on Mars. Scientist believe there may have been in the past because of the frozen water and snow that appear on some portions of its surface. Because it is farther from the Sun than Earth, Mars' temperature is much colder. No signs of life have been found on this planet. It takes 68 days for Mars to orbit our Sun.

JUPITER, the largest of the nine planets, is comprised mostly of hydrogen and helium gases. The surface we see from our telescopes is really a thick cloud layer. Scientist believe Jupiter's surface is made up of gases, a small portion of liquid, and a rocky solid core. A thin ring with several satellites go around the planet. Jupiter's atmosphere and pressure beneath the cloud layers causes this planet to be extremely hot. To date, sixteen Moons have been discovered to revolve around Jupiter. It takes 12 Earth years for this planet to orbit the Sun.

SATURN, the sixth planet from our Sun, is the most spectacular one. It is the second largest planet of the nine. Because of Saturn's distance from the Sun, it is extremely cold. Saturn is surrounded by captivating rings made of small particles of ice and/or ice-covered rocks. To date, 17 Moons have been noted encircling this planet. It takes 29 Earth years for Saturn to revolve around the Sun.

URANUS is the third largest planet and the seventh from our Sun. It appears to be almost colorless, for it is slightly bluish green with a bland, smooth surface. It is surrounded by a gaseous (methane, helium and hydrogen) cloud. Like Jupiter and Saturn, it too has rings—eleven of them! When Uranus revolves around the Sun, it is tilted in such a way that its north and south poles point directly to our Sun. (In some instances, it's north pole faces the Sun. Seasonal changes on this planet must be very different from those on Earth. We will learn why later on.) It takes Uranus 84 Earth years to travel around the Sun. This planet has 15 known satellites.

NEPTUNE is the fourth largest planet. Eighth from the Sun, it is much colder than Uranus and extremely colorful. Neptune is surrounded by a gaseous atmosphere, comprised mostly of hydrogen, helium and methane clouds. Strong wind gusts and gales occur on its surface. Its inner core is extremely hot. Neptune has several rings made of dust and small rocks and is to date is known to be encircled by eight satellites. Titan is its most well-known Moon. It takes 165 Earth years for Neptune to revolve around the Sun.

PLUTO, the ninth planet and farthest away from the Sun, is so distant that not much is known about it. Space scientists have, however, learned that Pluto is very small. (If we could stand on Pluto, our Sun would look like a very bright star.) It has one satellite, Charon. Both this planet and its Moon appear to be completely covered with ice and frozen (methane) gas. Pluto's temperature is extremely cold (350 degrees below zero F). It takes Pluto 248 Earth years to travel around the Sun! Space researchers have also learned that, for now, something unusual is happening to the orbit of Pluto. Although this planet is furthest away from the Sun, its orbit during the 1990s has made it "trade places" with Neptune. For now, it is not the ninth, but the eighth planet. NASA scientists state this phenomena will continue through 1998.

Are there any more planets beyond Pluto?

Although not proven, scientist believe there may be a planet much farther out than Pluto. Perhaps you will become the scientist who makes this discovery!

Shared Reading: *Postcards from the Planets* by David Drew.

Related Creative Writing/Math/Art Activity : Have your students pretend they have visited the planets. Based on prior visual presentations and discussion, have them describe shapes that can depict their spacecraft and celestial objects, each planets' characteristics, the clothing they had to wear, life forms if any, and how they felt being on the planet. (See Appendices B and C)

Which planet comes first?

The use of mnemonics is a great way to reinforce logical thinking and language arts skills—and to remember planet order. Ask your students to listen closely to this zany sentence, particularly the initial letter sound in each word:

“My very educated monkey just served us noodle pudding!”

Have the children call out the letters: M V E M J S U N P. Give a clue that the first letter in each word stands for a planet. Randomly call on students to name each of the planets based on the initials shown. For those students who would like to face a fun-filled challenge, have them create their own mnemonic variation!

PLANET PLACES . Planet order from our Sun, working together in groups, and the reinforcement of directionality concepts (left-right) and sequential order from 1 to 10 (using both ordinal and cardinal numbers), are experienced during the following exercise.

Labeled 8 1/2” by 11” display cards of each planet and our Sun (provided by NASA*) are preferred visuals for this activity, but hand-drawn pictures created by yourself or your students can be used. Ten students (presenters) will be needed to help with this activity. Tape a line on the classroom floor as a marker on which the presenters will stand during this exercise. The remainder of the class will be broken up into tabled teams identified by astronomical terms (e.g., “The Orbits”, “The Satellites” . . .)

Face downward, the teacher scrambles the display cards. Each presenter will select a picture (keeping it face downward) and stand on the taped line. When all ten are in place, each presenter will hold up his/her selection. Together, the entire class will identify each pictured item. The fun begins!

Call on a team to put the presenters in planet order. Allot two to three minutes for each team to determine where the presenters, with pictures visibly in hand, are to be aligned. Win or lose, students will have fun learning to recognize the order of the planets.

Why do planets that are farthest away from the Sun revolve more slowly than those closest to it?

Using estimation, measuring skills and spatial concept recognition, children will experience the answer to this brain teaser. This experiment, should first be demonstrated by the teacher and subsequently experienced by each student. It is best to conduct it in a school gym or outdoor play area. (Note: This experiment does not present a true picture of rotation and revolution. It does, however, provide students with a sense of a planetary movement.)

You will need a yardstick, a little over one yard of sturdy string, a metal washer, and muscle power. Also encourage the children exercise caution when conducting this experiment. Wrap and securely fasten the string around and through the center of the metal washer. Hold the other end of the string securely. Outstretch your arm sideways and swing your wrist such that the washer moves in a circular path. Spin at the slowest speed possible to keep the string taut. Ask the children to watch closely, focusing on the speed of the washer at this distance. Repeat the process, this time snugly holding the center of the string. Ask the children what they notice. (They should observe that as the string’s length shortens, faster spin keeps the string taut and the washer in orbit. When the string is lengthened, slower and longer circular motion take place.) The principle just witnessed is similar to the movement of planets as they orbit the Sun.

*Refer to Teacher Resource Listing to order laminatable prints.

Variation . To get an added sense of why planets that are farthest away orbit the Sun more slowly, try this outdoor activity. A clothes line or jump rope about four yards long and a school gym or outdoor play area are preferred. Have one child serving as an anchor hold one end of the rope. Have another child grasp the center, and another hold onto the other end. Pull the rope tight enough so that the rope remains taut. Have the anchor begin to spin in place at a medium pace. The others should walk to keep pace with the anchor's movement. What happened? The child on the outer section of rope may be out of breath, for that person has to travel a longer distance to keep the rope taut and to keep up with the spin of the anchor. The one closest to the anchor is moving fast and keeping up with the spin of the anchor—and didn't have as much distance to travel. This principle is again similar to the orbit of the planets around our Sun.

What is the difference between revolution and rotation?

Provide students with an understanding of these two types of motion through a fun-filled, role-play activity. For openers, the teacher should serve as a "planet role model". Lay a poster-size picture of the Sun in the center of the floor. Tell your students that you will pretend to be a planet, and you have made up a planet name of your very own. "I'm the planet Zebnob, and I will rotate." Begin spinning slowly in place. "I am the planet Zebnob, and I will revolve." Begin taking small steps in a circular path around the Sun. "I'm the planet Zebnob, and I will rotate and revolve around the Sun." This time, spin while pacing yourself slowly around the poster. Ask, "What happened when I rotated?" Children should identify that you began to spin. "What occurred when I revolved." Children should recognize that you moved in a circular path around the Sun. Add that the path taken around the Sun is also known as the planet's orbit. "Who would like to revolve or rotate around the Sun?" Remind your children to make up a planet name. Randomly call on children to join in, and encourage full class participation.

Culminating Activity : Reinforcing directionality, listening and logical thinking skills, and the concept of planetary movement can also be achieved during gym or recess with the following activity.

Have your students latch hands and form one enormous circle. Lay a poster-sized picture of the Sun in the center of your circle. Have each child stay in place, leave an arms length of space between each participant, drop hands, close their eyes, and imagine they are a planet. Call out: "Planets rotate!" The children should spin in place. Call out again: "Planets revolve!" The children should step slowly, side-by-side in a circular path around the Sun. "Rotate and revolve." Make the activity interesting by calling the terms out in an unpredictable pattern. The outcome: The concepts of rotation and revolution/orbit will be long-remembered.

SECTION TWO: OUR SUN AND OTHER STARS

Objective : To discover and examine the characteristics of a star; to take a close-up look at our star, the Sun, and its impact on the nine planets.

Skills Focus: Observation and prediction, size discrimination, number sequence review (expanding numbers from 1 to 20) visual discrimination (difference/similarity), spatial concept recognition (near-far, larger-smaller) and directionality (left-right, front-back . . .), and measurement through estimated, non-standard units of measure; develop and enhance language arts through journal writing, poetry and role play; discerning information-based and fiction literature.

Key Words:	galaxy	constellation	scintillation	vaporize
	luminescent	radiate	reflect	refract

A star is an enormous ball of glowing gas. Despite their small appearance in the night sky, stars are extremely large. Also referred to as points-of-light, they look like tiny dots because they are far away from us. From Earth, stars twinkle because starlight comes to us through moving layers of air that surround our planet. Stars shine brightly during the day and night, but we can only see them when the sky is dark and clear. (The Sun's light is so bright during the daytime that it keeps us from seeing other stars).

Stars appear to move across the night sky. Even our star, the Sun, seems to rise in the east and set in the west. This movement comes from the rotation of the Earth, not the stars. Stars do move, but because they are so far from the Earth, their motion often goes unnoticed.

No one knows exactly how many stars there are. On a clear night, a person on Earth can see as many as 3,000 stars at a time. Most of these are the brightest stars. There are others that cannot be seen without a telescope, but they are there. The color of a star tells you its temperature. Have you ever watched the flames on a stove while your parents were cooking. You may notice that when the flames first flicker, they are orange in color, but as the burner is turned higher and stays on the longer, the flames turn blue. That color change indicates that the flame is getting hotter—but not as hot as the stars! Stars vary in temperature. The temperatures that follow provide base point figures, but give you idea of how powerful a star's energy really is: Red stars are the coolest temperature (5,000 degrees F); yellow stars are hotter (our Sun is about 10,000 degrees F on its outer surface); and blue stars are the hottest (50,000 degrees F).

What is our Sun?

The Sun we see daily is actually one of billions of stars. It is luminescent, that is, it gives off its own powerful bright light and radiates energy. Although it appears very large to us, when compared to other stars in the galaxy (a family of stars), it is mid-sized. Like other stars, our Sun is an extremely hot ball of gas made mostly of hydrogen and helium, plus a smattering of oxygen, carbon, nitrogen and neon. The temperature at its core is extremely hot (30,000,000 degrees). Our Sun is so hot that if we were to put a van near its surface that van wouldn't melt: It would vaporize—poof, disappear just like that!

Our Sun is the major source of heat and light for each of the nine planets in our Solar System. In fact, our Solar System is called just that because our Sun is the center point of the nine planets. On our planet, the Sun helps living things like plants and animals to grow. It gives us warmth and light. Without the Sun, life on Earth would not exist.

PRECAUTION: Because the Sun gives off such powerful light and heat energy, never look directly into the Sun with the naked eye or through a lens, telescope or binoculars. An individual can permanently damage his/her eyes—even become permanently blinded by looking directly into the Sun.

How can we begin to recognize the thousands of stars in the sky?

People from differing cultures throughout the world, for endless years, have asked this question. Long ago, they made recognizing the stars easier by using their imagination and creating a connect-the-dot game in the sky. They used a pattern of stars to form a picture of something familiar—like animals, people or objects. The pictures they created are known as the constellations.

Stars that help form the constellations are usually very bright. One of the most easily recognizable constellations is the Big Dipper. It has seven stars. If you can imagine each of those stars being part of a connect-the-dot pattern, you will be able to see a ladle—a giant spoon with a curved handle—in the sky. Cassiopeia, an African (Ethiopian) queen; Orion, the hunter; and Aquila, the eagle are but a few of endless numbers of constellations found during different times of the year.

Note that if you live in large cities, where streets and buildings are ablaze with electric lights, it's difficult to see the myriad of stars in the night sky. Bright city lights pollute our night sky, interfering with our ability to see the galactic display. It's best to see constellations, other stars and planets in a place where it is dark enough for viewing. On a countryside away from large cities, or on a clear moonless night in a place where there is minimal electric lighting are great locales.

Also note that it takes practice to become familiar with constellations. A star chart (planisphere) can be used to help find constellations.

Shared Reading Resource: The Heavenly Zoo by Alison Lurie

Suggested Sing-Alongs: "Oh Mr. Sun, Oh Mr. Moon", "Twinkle, Twinkle Little Star" (Song tape available in Yale-New Haven Teachers Institute: See Teacher Reference)

DISCOVERY THROUGH RELATED ACTIVITIES

How does our Sun affect temperature on each of the planets?

The closer a planet is toward the Sun, the hotter it will be. Let's conduct an experiment to see how. You will need a student desk lamp with a 75 watt bulb, three mounted Fahrenheit thermometers, and a yardstick. Lay the yardstick on a cleared desk. Place one thermometer the 4" mark, another at 14" and another at the 36" mark. Turn on the desk lamp, aiming it at the front end of the yardstick. Keep the lamp on for approximately 10 minutes. Thereafter, record the temperature at each yardstick marking. You should notice that the temperature on the thermometer closest to the lamp is higher than those farther away. The heat from the Sun, similarly, provides more heat and light energy to closer planets.

How can the Sun's light hurt our eyes if we look at it directly or through a lens?

This experiment should only be conducted by the teacher in an open area like a school play yard. You will need a sheet of paper, a bright, sunny day and a simple hand lens to conduct this experiment. Place the sheet of paper on the ground. Using the hand lens, focus the sunlight onto the sheet of paper. A perfectly round, very tiny circle will form on the paper when the light is focused. You may have to squint your eyes, for reflected sunlight may interfere with your vision. It will not, however, harm your eyes. Hold the focused light in place for about five minutes. Just for a moment, have a student quickly touch the area of the paper on which the light was focused. What did he/she notice? (The student should find the area on which the light was concentrated is much hotter than the surrounding paper.) Have the student remove his/her finger, and continue to focus the sunlight in the same spot. After a while, something else will happen? (If focused correctly and long enough, the paper will begin to burn.)

Telescope and binocular lenses and the lens in your eye, just like the hand lens, focus light. Other components of your eye, just like that paper, could be damaged with prolonged contact with light. So remember, NEVER LOOK DIRECTLY INTO THE SUN!

If stars are big, why do they appear to be so tiny in our night shy?

When the night sky and our eyes get together, they play tricks on us. Let's discover how! (This tried and true exercise is best conducted in a large space, like your school corridor or gymnasium.) You will need three grapefruits and three oranges, two "large feet" for estimated measurement purposes, and three students. Have the children determine which person in the class has feet closest in size to the length of a 12-inch ruler. (The teacher will probably be selected.) Using the chosen individual, measure an approximate 12-foot distance, marking that point with tape. Repeat the same distance three more times, and correspondingly mark each noted distance. Have three students, each with a grapefruit and orange in each hand, stand along the strategic points so that each child is visible to onlookers at the extreme opposite end of the hall. Have them hold the fruit up. What do you notice? The citrus fruits, despite their actual size, appear to be much smaller. The angle and distance from which the observer stands impacts the way we see size of an object. This principle applies to the stars we observe in the sky.

Why do stars twinkle?

Have you ever been in a house during a cold winter's day, and the radiator was on full blast. Notice how objects around that radiator appear to shimmy even though you know they are standing still. Or have you ever seen water boiling on a stove? The hot air rising out of the pot appears to make the area around the stove wave. The moving air in both instances make you think the objects behind them are wiggling. That's similar to the principle behind why stars twinkle. It's called scintillation. Let's conduct two experiments to take a closer look. (Although the two experiments that follow can be conducted in class, they make great homework assignments and are best conducted in a very dark room.)

The following presentations should initially be teacher-guided. Before conducting the scintillation portion of the experiment, first introduce the concept of light traveling in a straight line .

You will need a flashlight and a table top, wall and floor. With flashlight off, aim it straight in front of you, directly at a wall. Where do you think the light will land? Try it and see. (The light should fall directly on the wall where aimed.) Again, flashlight off.

This time, hold the flashlight overhead towards the top of the table. Where do you think the light will land? Turn it on. (The light should land where targeted.) Flashlight off. Point it directly overhead towards the ceiling. Where do you think the beam of light will appear? (Again, the light should land where directed.) You've guessed it! Turn on the light. (In each instance, the children will discover that you can determine where the light will land, for it traveled in a straight line towards the object on which it was directed.) Conclusion: Light does travel in a straight line.

So, how does this concept affect stars seen from our planet? You will need to use the flashlight once again, along with a 10" by 10" sheet of aluminum foil, a 2-quart glass mixing bowl filled midway with water, and a darkened room to discover why. First, crumple the square piece of foil and reopen it, laying it outstretched beneath the water-filled bowl. Let it set until the water within is absolutely still. Hold the flashlight approximately 12” above the bowl. Focus it towards the center of the bowl. Turn it on, and take a look at how the light reflected from the foil looks. (Students should see a clear, circular patch of light.) Continuing to hold the light overhead, carefully move the bowl so that the water moves within. Look down on the circle of light inside of the bowl. (Students will notice the light appears blurred and jiggly. Actually light is bending and bouncing off of the moving water creating a shimmery effect.) This occurrence is similar to what happens in the night sky. Light rays that usually travel in a straight line are slightly bent because of air and atmospheric movement.

Suggestion : As a conclusion to this unit, take your class on a trip to a major or local college-housed planetarium.

SECTION 3: EARTH AND SUN—WORKING TOGETHER

Objective To take a closer look at our planet and its interaction with our Sun and Moon.

Skills Focus Prediction, patterns and more detailed view/understanding of a day, month, year and the seasons; directionality/country and continent location through globe use; language arts enhancement through journal writing, poetry, song and role play; and discerning/exploring information-based and fiction literature.

Key Words:	temperature	seasons	time	evening
	a.m./p.m.	morning	afternoon	night

Before jumping into this unit, jot down facts that your students already know. Review terms like “revolve, rotate, gravity . . . ” Ask the children to demonstrate—or in their own words explain—some of the concepts learned through previously taught activities. Act as though you’ve forgotten bits and pieces of valuable information, and make open-ended statements to which the children will respond. (E.g., Planets move around the Sun in an egg-shaped orbit. That shape is (elliptical). Oh thank you so much class! I don’t know what I’d do without you. While spinning around its axis, our planet also orbits the Sun. What’s that other word for traveling around the Sun? (Revolve). Yes, that’s it. And that invisible force that holds the planets in place as we orbit the Sun, um . . . . (Gravity). What a knowledgeable class you are!)

This type of fun-filled review will reinforce your students’ enthusiasm about the subject matter, and assist them in understanding more detailed information concerning our planet.

What does time and planetary movement have in common?

We know that the big and little hands on a clock help us tell what time it is. We also notice that something happens as the hours move on: they turn into days. We have learned that the days of the week go from Sunday to Saturday, and that there are seven of them. But every 30 or so days, another change takes place: we enter a new month. We know there are twelve months, and that after December, a new year forms. Hey! A lot of interconnected patterns are taking place. But what does it all symbolize?

Remember that our planet is constantly rotating. Look at the clock. Each time the long hand goes around the face of the clock—from the number 12 back to 12 again, and the short hand moves to the next number, the Earth has rotated a little bit more, and an hour has passed. For each hour that goes by, the Earth is rotating a little more. It takes 24 hours for our planet to rotate completely. That 24-hour spin is known as our day. What other "things" might be occurring? Let's find out!

DISCOVERY THROUGH RELATED ACTIVITIES

How does Earth movement affect day and night?

A Judy clock, a timekeeper, four 12" x 14" display cards (one with a drawing of the Sun labeled a.m., another with a setting Sun labeled p.m.; another with a Moon labeled p.m. and another labeled a.m). The teacher will initially represent planet Earth. Selected students will serve as the Sun and timekeeper. Begin at 12 o'clock in the afternoon. Ask the timekeeper to show that time, then 1 o'clock, 2 o'clock, 3 . . . and so on. Each time the timekeeper moves an hour, the "Earth (teacher)" should rotate. At strategic points, hold up the posters to reinforce the idea of a.m and p.m. occurring as the Earth spins. This process should continue until we reach 12:00 midnight. (Although the following question may be puzzling for some, ask, "Which picture do you think represents 12 a.m?" Through this exercise, the children will eventually begin to understand why it can be dark outside during early morning hours, and why the Moon and Sun can sometimes be seen simultaneously.)

Language Arts Extra: What do you do at "? O'Clock"?

As a follow-up exercise to reinforce telling time by the hour, have the children think about things they do during certain times of a day. Provide a worksheet (see Appendix D). Based on time unit lessons covered in class, have the children write about what they do at 3:00 p.m., 12:00 p.m., a.m . . .

What is an Earth year?

It takes 365 days for our planet to revolve around the Sun. The time that it takes for the Earth to orbit our star marks one year. Let's refer to a 12-month calendar to explore further.

Holding up calendar, ask the children to ignore the numbers seen thereon, but to instead, count by ones as you point. Begin counting and ask your students to join in. Encourage them to count to 100 and notice the pattern as you count. (Although counting to 100 is not required at this grade level, many students will catch on to the number pattern and will count further.) When you've reached the last number, shout, "Wow! 365!" Reinforce the opening statement by asking, "What do you think might be happening to the Earth each a day passes by?" Solicit student responses. (Someone may make the connection with planetary movement being involved.) If someone gets the answer, emphasize, "Great thinking!" Based on prior discussions, the class should begin to conceptualize a year.

Why do we have seasons?

(During the following explanation, use a globe to demonstrate where the imaginary poles would be located on our planet. Also, at strategic points throughout your discussion, use a flashlight to demonstrate how sunlight reaches certain areas of our planet based on its tilt and spin. Use the globe once more when discussing Uranus' axis.)

The Earth’s axis is tilted in such a way that different parts of the planet receive different amounts of heat and light. When the northern portion of the Earth is tilted toward the Sun, the Sun is high in the sky. Because of this, days are longer and the weather is warmer. This type of movement and tilt causes summer. When the northern portion of the Earth is tilted away from the Sun, days are shorter and the Sun appears low in the sky. You’ve guessed it. Wintertime!

Brain Teaser: It was shared earlier that the planet Uranus’ north and south poles at times face the Sun. If the Earth was tilted like the planet Uranus, how do you think it would affect our seasons? (Using the globe, find other countries on our planet that would have hot summers and cold winters.)

Suggested Role Play/Sing-Along Activity : Have your students form a huge circle around the room. One quarter of the way around the circle, lay a marker designated “Spring.” Continue around and repeat this quarter-length distance, strategically placing a marker for each of the remaining seasons. Select one child to stand in the center of the circle, representing the Sun. The others will begin to sing the “Season Song,” revolving and bending slightly towards “the Sun” *only* when they land on a season. (See “Season Song” lyrics on Appendix D; music sample available on cassette at Yale-New Haven Teachers Institute.)

SECTION 4: OUR MOON UP CLOSE

Objective To better understand our Moon as a natural satellite.

Skills Focus Visual discrimination, sequence and patterns, and logical thinking; language arts development through journal writing and oral communication.

Key Words:	phase	waxing	crescent	full Moon
	new Moon	gibbous Moon	craters	waning

Long ago, people believed a man’s face could be seen in the Moon or that the Moon was made of cheese. Many of these folkloric tales have resulted from man’s lack of understanding of the Moon. But much time has passed, and we have become a bit wiser.

On July 20, 1969, Astronaut Neil Armstrong set foot on the Moon. Numerous rock samples have been brought back to Earth for observation. Through space travel and years of scientific research, scientists have learned much about the Moon’s surface. We know it has no atmosphere nor wand plains. (What was once thought to be the “face of a man” and “cheese” are actually shadows cast by mountains, valleys and craters on the Moon’s surface.) Scientists have also learned that there is no life on the Moon.

The Moon is our closest neighbor in space, yet it is far away from Earth. It looks huge because it is so close to us. If, however, we were to put the Earth alongside the Moon, the two would respectively look like a basketball and a tennis ball side-by-side. The Moon is the brightest object in our night sky, yet it gives off no light of its own. When the Moon shines, it is actually reflecting light from the Sun—somewhat like a highway reflector when car lights hit it. Ever notice that at times, the Moon looks like a bright round plate, and at other times, its shaped like a crescent roll. Then it looks like a capital D. These different shapes are known as phases of the Moon. As the Earth revolves around the Sun, the Moon orbits the Earth. Depending upon the location between the Earth and the Sun, the Moon appears to change shape, but it really isn’t.

Although the Moon takes on many phases, there are four basic ones to know: new, first quarter, full and third quarter. When the Moon is new, it lays between the Earth and the Sun. The side that is shining is not visible from our planet at this time. When the Moon is 1/4 of the way through its orbit, we see a shape like a crescent. The crescent continues to grow. When the Moon is at its highest point in the sky, we see half of the Sunlit side. It is said that the Moon is *waxing* that is, appearing to get larger. The Moon continues to grow. When it looks like a stretched out letter D, it is said to be a *waxing gibbous Moon* . When the Moon is *full* , we see that large white circle in the night sky. The side of the Moon that is receiving Sunlight is now facing our planet, thus we experience its splendor! Days pass, and the size of the Moon appears to grow smaller. It is waning: The Moon phases repeat themselves in reverse until we see no Moon at all. Back to a new Moon, the phase cycles begin again.

DISCOVERY THROUGH RELATED ACTIVITIES

What are craters. and how did they get on the Moon's surface?

A crater is a hole created when a meteorite or asteroid hits a Moon or a planet. Our Moon is covered with craters. Try this experiment to get a feel for what has happened to the Moon's surface over the years.

Pour a 1/2-inch layer of flour or talcum powder into an unbreakable shallow dish . Using different size rocks and pebbles, hold them a few inches over the dish and release them. Upon impact, the falling objects will scatter the powdery substance. Remove them, and you will notice they've left different size impressions. Heavenly bodies such as Asteroids and Meteoroids hit the Moon's surface with great force, similarly leaving huge craters on the Moons surface.

If the Moon gives off no light of its own how does it shine?

The Moon's surface reflects the light of the Sun. Conduct this experiment at night to learn how. You will need a flashlight, an extremely dark room, and a 7-inch paper plate covered with aluminum foil. Tape the covered plate to a wall in your room. Turn out the light. Point the flashlight towards the plate, and turn it on. The plate glows only when the flashlight is on. Alone, the foil-covered plate (like the Moon) does not give off light. Moonlight occurs based on a similar principle. What do you think would happen to Moonlight if there was no Sun?

If it's not disappearing, why is the Moon changing shape?

(The following exercise serves as a great homework assignment and is best conducted at night. It should, however, be first demonstrated in the classroom.) You will need a ball and a table lamp to better understand what happens when the Moon enters its phases. Pretend you are the Earth, the ball is the Moon, and the lamp is the Sun. Turn on the lamp; it should be the only light on in the room. Stand three or four giant steps away from it. With the lamp in front of you, hold the symbolic Moon outstretched in front of you, and pivot slowly to the left. It's like pretending the Moon is orbiting around you. Look closely at the way the light hits appears on the ball. Keep pivoting, and you will notice phases on the ball,just like we experience phases on the Moon.

Teacher Note : As an additional Science/Math/Language Arts reinforcement, have the children experience Moon phases through journal writing. For a month-long duration, have your students observe the Moon in the night sky. Students should record their findings in a composition notebook (or teacher-made journal comprised of stapled writing paper). Every five to seven days, ask you children to draw the shape of the Moon they noticed in the sky. Each child (with the assistance of their parent and/or through inventive spelling) should write a shape that the Moon looked like (a pizza, a cookie, a banana . . .) The date (month, numeric date, and year) on which it was seen. Encourage the use of complete sentences. Observations can be shared in class.

Shared Reading: *The Greedy Man in the Moon* by Rick Rossiter

The Day We Walked on the Moon by George Sullivan

MOON PHASE/MOON FACT MURAL: A CULMINATING ACTIVITY

Based on student observations and findings, and what has been learned in class, students will create an informative Moon exhibit. Eight large, smooth-edged paper plates will be needed to depict the phases of the Moon. Black poster or tempera paints and paint brushes, large dark blue construction paper, and loads of pencils and writing paper will be needed to complete this effort.

A team of students will be needed to (1) paint the Moon phases on the paper plates; (2) help mount and design the finished work, (3) write information they know about each depicted phase of the Moon; and to write general information concerning the Moon. The completed display can be showcased along the school corridor or in the classroom.

SECTION 5: OTHER CELESTIAL BODIES

Objective To take a glimpse at other objects found in our Solar System.

Skills Focus Visual discrimination, examining fact and fiction through role play, storytelling, and creative writing.

Key Words: Asteroids Comets Meteors Meteorites
Meteoroids sublimes

What are Asteroids, Meteors, and Comets?*

Asteroids are known as minor planets. Many look like broken pieces of rocky metal, filled with holes and jagged edges. Others look like crater-filled balls of solid formerly melted rock. They rotate and revolve around the Sun, and are found between the planets Mars and Jupiter (an area known as the asteroid belt). Some asteroids are as small as a pebble on the beach. Others are tremendous, as wide as 40 cars lined up together. Some scientists believe asteroids are broken pieces from other planets, but no one really knows how they came to be.

Meteors are more commonly called Shooting Stars. They look like bright streaks of light briefly zooming through a clear night sky. Their light is caused by friction, the rubbing of two objects together. In this instance, the speeding meteor and the air in the Earth's atmosphere are rubbing together, causing light sparks to form in the air around the meteor. Most of the meteors that we see start out the size of a little grain of sand. Sometimes, metallic particles from the meteor (called meteoroids) enter the Earth's atmosphere. If they hit the ground, they are called *meteorites* . Usually, they are very small, but some that have crashed on Earth look like a huge, bumpy metallic rock.

A *Comet* differs from a meteor in that it is a mixture of frozen water and gases mixed with dust and other particles. It's like a dirty snow ball. Comets orbit the Sun very slowly way beyond the planets, but sometimes we can see them.

When a comet travels near the Sun, it sublimes, that is, its frozen, solid form changes immediately into a gas. As the gases are released, solar winds push them. We see the comets ablaze followed by a glowing tail.

*Note: Use visual aids provided by NASA when presenting these celestial objects.

DISCOVERY THROUGH RELATED ACTIVITIES

Weather (and parents) permitting, plan a Sky Watchers' Night excursion. Together, your students and parents can experience planets, constellations, and meteor showers that are visible in your vicinity. Those who join in will long remember the experience. (On a clear night during April 1996, several of my first graders joined me in locating the planet Venus with the naked eye. Upon returning to school the next day, they painted pictures and enthusiastically talked and wrote about it in class.)

Whether you have minimal or full-class trip participation, the spellbinding results are contagious and often spark independent study and observation on behalf of nonparticipating students. Binoculars, telescopes, a planisphere, the naked eye and a clear. chaperoned youngsters and a moonless night away from city lights are all you'll need. Take photos or videotape your trek. Follow up with journal writing about the experience.

Note : A schedule of planet, constellation and meteor shower appearances are often listed in non-specialized journals like *SKY AND TELESCOPE* and *ASTRONOMY* . These publications are available in the public library and specialty newsstands. Take advantage of these resources. Just in case you are as enthusiastic about experiencing a meteor shower as I am, here's a quick reference meteor shower calendars:

RECURRING METEOR SHOWERS

FOUND NEAR

PEAK DATE	THE CONSTELLATION
January 4	Quadrantids
April 21	Lyrids
May 4	Eta Aquarids
July 28	Delta Aquarids
August 12	Perseids
October 21	Orionids

November 3, 1 South Taurids, Leonids
December 13, 22 Geminids, Ursids

Shared Reading: *The Man Who Lit The Stars* by Claude Clemente

CONCLUSION

We've learned much about Our Planet . . . Our Solar System, but there's much more to discover! As a follow-up to the information, experiments and suggested activities noted herein, take your class (and/or encourage their parents) to visit a nearby museum or planetarium. Your local library can help offer a wealth of written and/or audiovisual resources. Network with the children's librarian in introducing your students to age-appropriate literature and reference materials re: space travel, rockets, the planets, our Solar System, astronomy-based folklore and myths from cultures throughout the world . . . the resources are endless!

SUGGESTED READINGS: NON-FICTION

Astronomy: The Cosmic Journey , Harmann, William and Impey, Chris. Wadsworth Publishing, Belmont, CA (Fifth Edition)

Space, Stars, Planets and Spacecraft, Becklake, Sue. Dorling Kindersely Limited, London/New York (1991)

How the Universe Works . Couper, Heather and Herbert, Nigel. The Reader's Digest Association, Pleasantville, NY (1994)

Our Universe, A Guide to What's Out There, Stannard, Russell. LaRousse Kingfisher Chambers, Inc., New York (1995)

The Universe for the Beginner , Moore, Patrick. University of Cambridge Press, New York (1992)

Planetarium, Brennar, Barbara. Bantam Books, New York (1993)

Astronomy Today: Planets Stars and Space Exploration, Moche, Ph.D., Dinah L. Random House, New York (1982).

A Book About Planets and Stars , Reigot, Betty Polisar. Scholastic Inc., New York (1988)

Rand McNally Discovery Atlas of Planets and Stars, Rand McNally for Kids, USA, (1993)

Discovering the Planets, Milton, Jacquieline. Troll Associates, New York (1991)

The Children's Space Atlas: A Voyage of Discovery for Young Astronauts , Kerrod, Robin. Millbrook Press, Brookfield, CT (1992)

Astronomy for Every Kid: 101 Easy Experiments That Really Work, Van Cleave, Janice Pratt. John Wiley and Sons, Inc., US (1991)

The Day We Walked on the Moon: A Photohistory of Space Exploration , George Sullivan. Scholastic, Inc., New

York (1990)

Black Wings: The American Black in Aviation , Hardesty, Von and Pisano, Dominick. Smithsonian Institute Press, Washington, DC (1983)

The Planets in Our Solar System, Branley, Franklyn. Harper Collins, New York (1981)

The Sky Is Full of Stars , Branley, Franklyn. Harper Collins, New York (1981)

The Constellations: How They Came To Be , Gallant, Roy A. Four Winds Press, New York (1979)

Selections by Seymour Simon.

The Sun	Mulberry Paperback Book, New York (1986)
Stars	William Morrow, New York (1986)
The Moon	Simon & Schuster for Young Readers, New York (1984)
Earth: Our Planet in Space	Four Winds Press, New York (1984)
Venus	William Morrow, New York (1987)
Uranus	"
Mars	"
Mercury	"
Neptune	Morrow Junior Books, New York (1991)
Saturn	Mulberry Paperback Book, New York (1984)

SUGGESTED READINGS: FICTION

The Orphan Boy, Mollel , Tololwa M., Clarion Books, New York (1990 (Ethiopian Tolktale re: why we see Venus at certain times of the year from our planet.)

The Man Who Lit the Stars, Clemente, Claude. Little, Brown and Company, New York (1992) (A french folktale re: comets)

The Greedy Man in The Moon , A Chinese Folktale retold by Rick Rossiter, Riverbank Press (1994)

Native American Star Myths, Monroe, Jean and Williamson Ray. Houghton Mifflin (1987)

The Heavenly Zoo, Lurie, Alison. Farrar Straus Giroux (1979) (Emphasis on the constellations)

Follow The Drinking Gourd , Winter, Jeanette. (A factually-based fiction work describing how the Big Dipper was used as a roadmap to freedom for African-Americans during slavery in our country.)

Postcards from the Planets, Drew, David, Rigby, Inc., Crystal Lake, IL (1988)

TEACHER RESOURCES

These National Aeronautics and Space Administration (NASA) affiliates provide complimentary lithographs, photos, audiocassettes and other resource packets upon written request. Correspond preferably on typed on school letterhead stationery. Allow two to four weeks for delivery.

The National Aeronautics and Space Administration

Goddard Space Flight Center

Mail Code 730.3

Greenbelt, Maryland 20771

(301) 286-8570

These National Aeronautics and Space Administration (NASA) affiliates provide complimentary lithographs, photos, audiocassettes and other resource packets upon written request. Forward your request on school letterhead stationery, and allow three to six weeks for delivery.

NASA/Goddard Space Flight Center

Mail Code 730.3

Greenbelt, Maryland 20771

(301) 286-8570

Aerospace and Environmental Education Resource Center

Media Building Room 138

Eastern Connecticut State College

83 Windham Street

Willimantic, CT 06226

ADDITIONAL RESOURCES

Superb Astronomy-related teaching supplies like the Orbiter (a contraption that simultaneously shows the Earth's orbit around the Sun and related Moon movement) and The Home Planetarium (a marvelous Constellation projector) can be purchased through NASCO, a Science supply vendor. Call (800)558-9595 to order a supply catalog.

Worksheet masters and Sing-Along Cassette complementing this curriculum unit are available for use and return at the Yale-New Haven Teachers' Institute.

RECOMMENDED SUMMER EXCURSIONS

Kennedy Science Center/Spaceport USA, Jupiter, FL

(407)452-2121

The American Museum of Natural History and Hayden Planetarium, New York City. (212) 769-5100

The Liberty Science Center, Jersey City, NJ*

(201) 200-1000

The Maritime Center, IMAX Theate Norwalk, CT*

(203) 852-0700

The Peabody Museum, Whitney Avenue, New Haven, CT

(203) 432-5050

Science Center of Connecticut, West Hartford, CT*

(860) 231-2824

The Smithsonian Institute National Air and Space Museum, Washington, DC (202) 357-1387

The Museum of Science and industry and the MOSIMAX Theater, Tampa, FL* (813) 987-6300

PACING CALENDAR*

Week	Day	Activity
1	1	Introduction through storytelling and group discussion.
	2	Planets—a pictorial visit.
	3	Storytelling and writing experience/Language arts.
	4	Planet order (patterns, categorization and sequencing exercises.
	5	Closer look at planet motion; journey to the planets language arts activity.
2	6	Sun safety; sun exploration through storytelling and pictorial display.
	7	Size, distance and scintillation experiments.
	8	Sun temperature and its impact on the planets.
	9	Constellation s through storytelling/sing-along/language arts.
	10	Scheduled trips and/or related culminating activity.
3	11	Planet review. Rehash “day,” “month,” “year” concepts.
	12	Introduce time with regard to Earth movement.
	13	Time/Earth Movement study continued.

	14	Reinforcement through role-play and language arts activities.
	15	Related pictorial presentations and creative writing activities.
4	16	Moon introduction through folkloric tales/non-fiction and pictorial presentation.
	17	Moon phases defined, followed by month-long lunar phase observation and journal writing activity (conducted by students).
	18	Group discussion re: Moon facts. Moon mural creation begins.
	19	Mural project continues.
	20	Mural project completed.
5	21	Asteroids, Comets, meteors briefly visited through NASA photos and folkloric storytelling.
	22	Unit review; K-W-L follow-up.
	23	Trips to major planetarium.
	24	Night Skywatching Excursion planned.

* Changing schedules and ongoing activities throughout the school year may impact this time line, but essentially following this sequence will prove helpful.

Appendix A

WHITE OUT “Appendix B” ANF REPRO this language arts worksheet. Then, (1) have your students use their imaginations and create a story by completing MY TRIP TO OUTER SPACE. After filling in missing words, have them (2) cut out and create a spaceship (use outline provided on the next page). Using sequins, glitter, mini-colored cut-outs, crayons, markers, glue sticks and a bit of imagination, encourage your students to decorate the spacecraft. Carefully mount the finished product by overlapping it onto this enclosed paragraph. (3) Using a glue stick, mount the entire creation onto a dark blue, purple, black or deep brown sheet of 8-1/2‘ x 14‘ construction paper. Students can subsequently include other heavenly bodies in the background. Wallah! Each student’s masterpiece is ready for display.

MY TRIP TO OUTER SPACE

by _____

I rode on a spaceship! I traveled all the way to the planet _____. It was a _____ trip. The temperature on the planet was _____ I had to wear _____ I walked around. I listened, and I looked around very carefully!

The ground on the planet was covered with _____. The sky around the planet was _____. I could see the Earth! It was so far away that it looked like _____! I walked around again, and I saw ____! It was time to go home. I got into my spaceship and went back to Earth. My trip was _____!

Appendix B

The Body

(figure available in print form)

The Nosecone

(figure available in print form)

Flames Emitted from the Rear End

(figure available in print form)

Appendix C

What Do You Do

(figure available in print form)

at This Time of Day?

Think about an “o’clock” time (like 8’o’clock in the morning or 9 o’clock at night). Drawing a long and short hand, fill in the time you have chosen on the face of the clock. Write about what you do at that time on the lines below. *Come on! You can do it!*

____

____

____

____

____

____

by __________

Appendix D

SEASON SONG

Summer is here, I’m tilted

Summer is here, I’m tilted

Summer is here, I’m tilted—this way towards the Sun.

Autumn is here, I’m tilted

Autumn is here, I’m tilted

Autumn is here, I’m tilted—this way from the Sun

Winter is here, I’m tilted

Winter is here, I’m tilted

Winter is here, I'm tilted—this way from the Sun.

Springtime is here, I'm tilted

Springtime is here, I'm tilted

Springtime is here, I'm tilted—this way towards the Sun.

Oh, round and round and round

Round and round we go

Round and round and round

Round and Round we go

Round and round and round

Round and round we go

Round and round . . . Oh

(Repeat Season Verses)

Song and Concept by Waltrina Mullins

Appendix E